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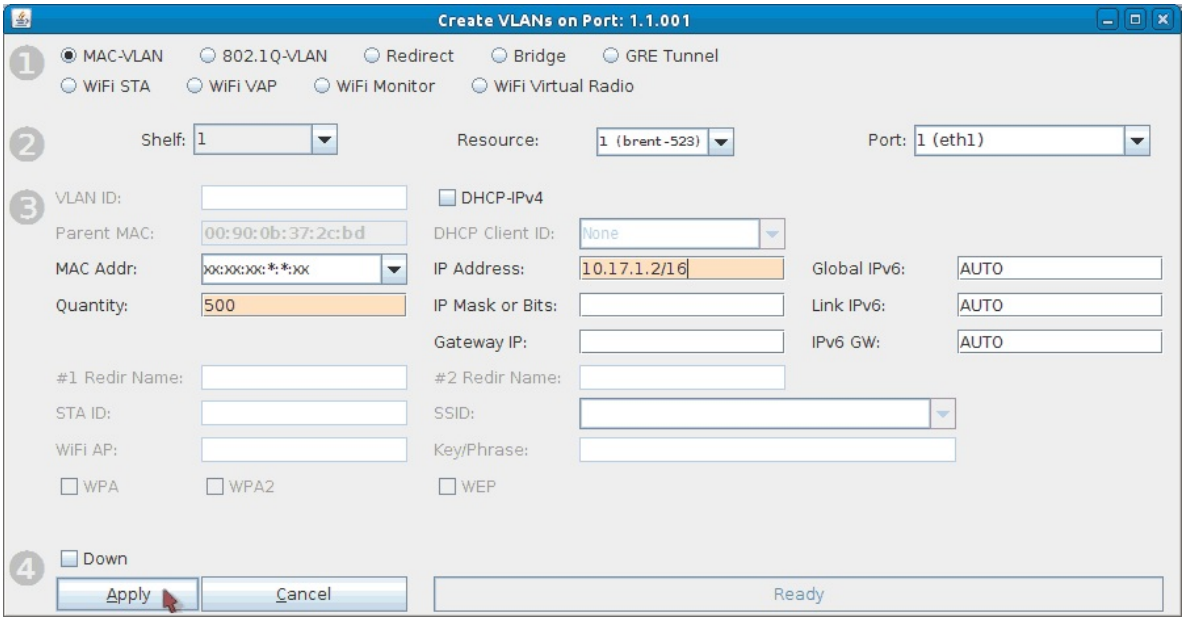
Scalability Testing with NFS File-IO

Goal: Analyze memory usage as the number of NFS clients is scaled up, and also when NFS endpoint settings are tweaked.

Hopefully by the end of this cookbook you'll have an idea how to assess how many File-IO endpoints and associated settings your system can support. This cookbook connects a LANforge system to a NFS file server. The file server in this example will be 10.17.1.1. It will be sharing 10.17.1.1:/mnt/tmpfs1. We will create 100, 250, then 500 readers and writers and compare memory usage as we also tweak the RW Size setting.

Note: For this example, we are using a CT523 with 8GB of memory. It is physically connected to the NFS file server.

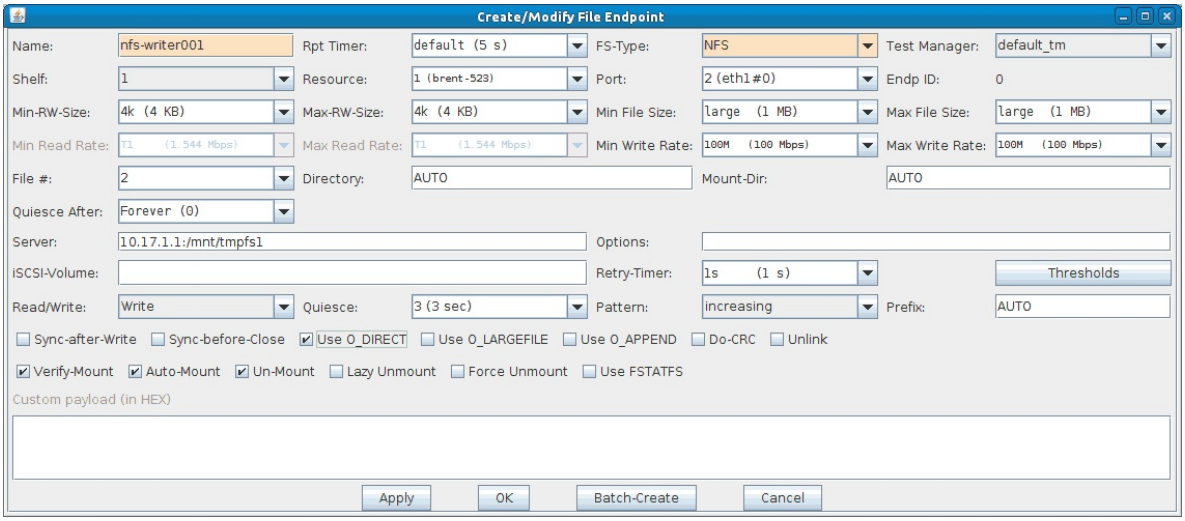
1. First, **500** MAC-VLANs will need to be created.
   A. In the **Port-Mgr** tab select port **eth1** and click **Create**.



   A. Select **MAC-VLAN**.
   B. Set **Quantity** to **500**.
   C. The starting IP address is 10.17.1.2/16 for this test. If your file server is on a different network, change the IP here accordingly. Make sure not to use the file server's IP address.
   D. Click **Apply** and close the Port Create window once all ports are configured. Make sure all MAC-VLANs get IPs, this may take some time.

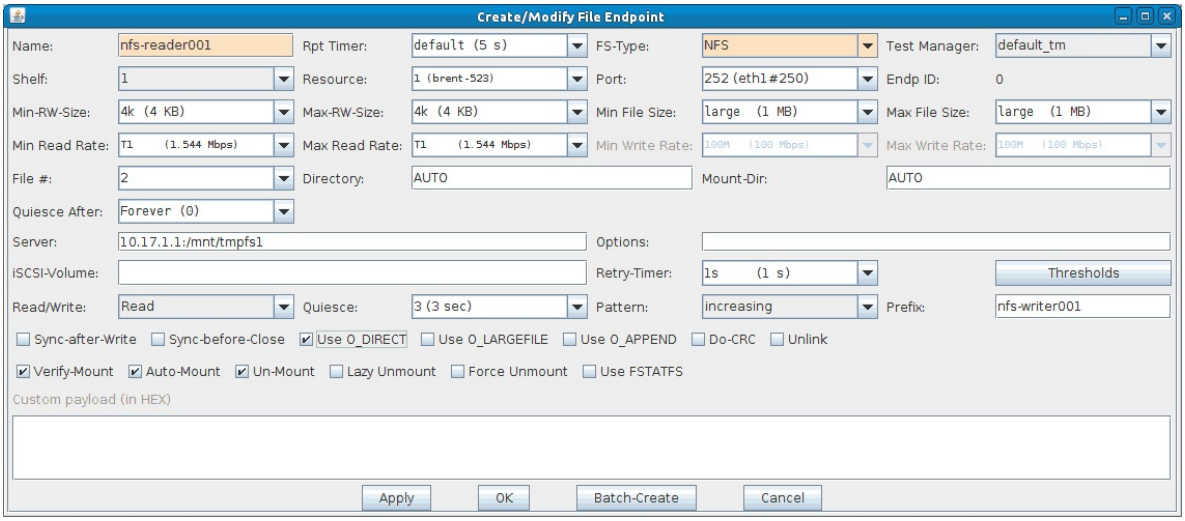
2. Create **250** NFS writers and **250** NFS readers. Batch create **50** at a time (49 for first batch of reader/writers). More information on creating File-IO endpoints can be found here: LANforge File-IO with CIFS and NFS

A. Any non-default settings for the **NFS writers** are listed below.



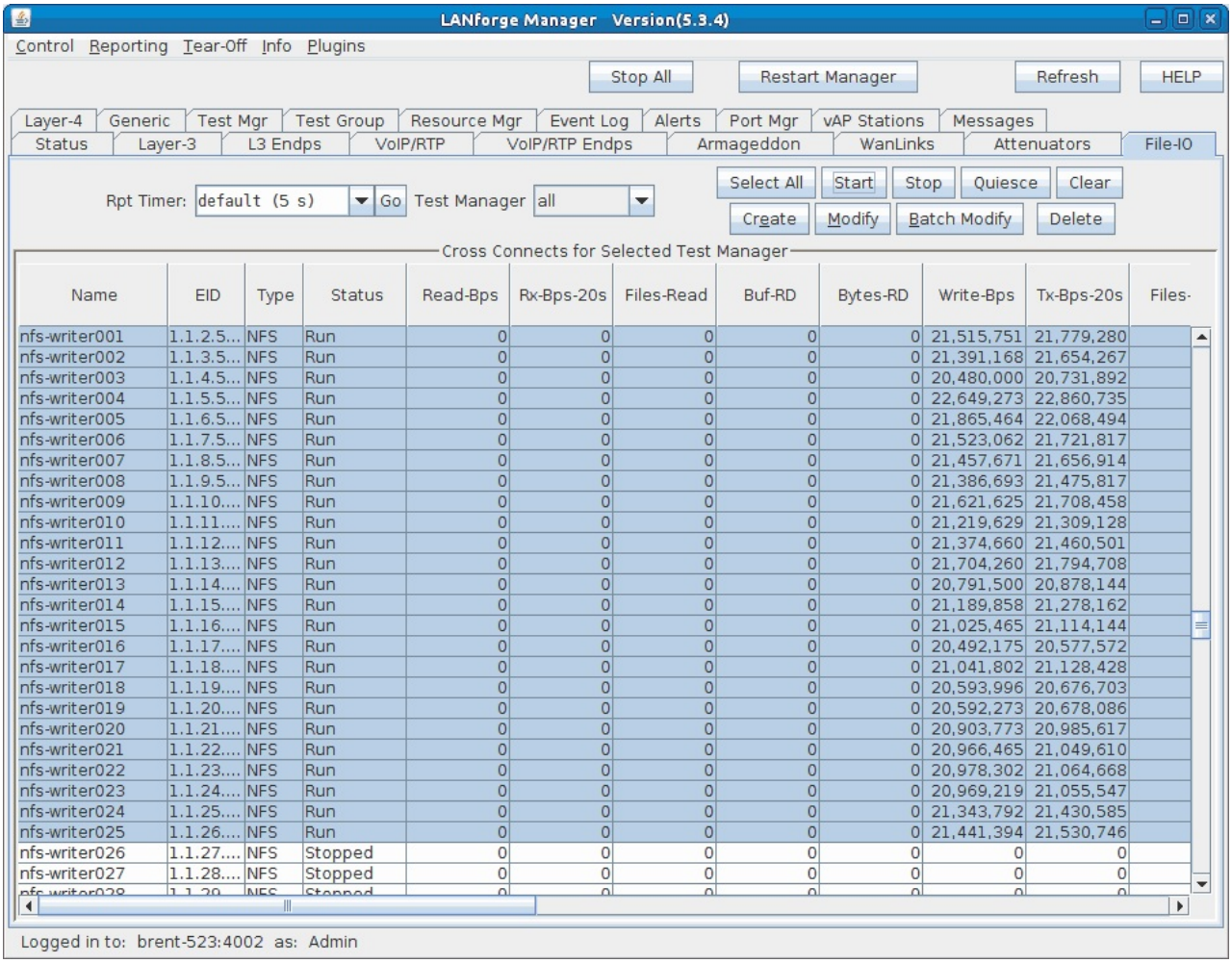
A. Name is **nfs-writer001**.
B. FS-Type: **NFS**.
C. Port is **eth1#0**.
D. Min-RW and Max-RW sizes are **4k**.
E. Min/Max File sizes are **1MB**.
F. Min/Max Write rates are **100Mbps**.
G. Quiesce After is **Forever**.
H. Server is **10.17.1.1:/mnt/tmpfs1** (use your own file server settings here).
I. Make sure Read/Write is set to **Write**.
J. Turn on the **Use O_DIRECT** checkbox.

B. Any non-default settings for the **NFS readers** are listed below.

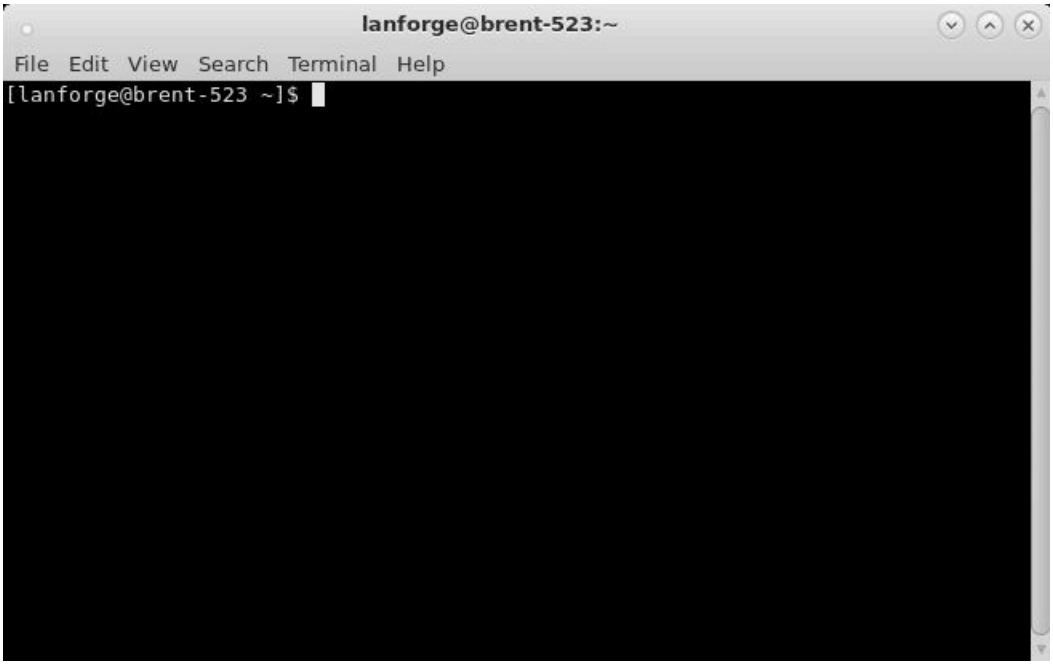


A. Name is **nfs-reader001**.
B. FS-Type: **NFS**.
C. Port is **eth1#250**.
D. Min-RW and Max-RW sizes are **4k**.
E. Min/Max File sizes are **1MB**.
F. Min/Max Write rates are **100Mbps**.
G. Quiesce After is **Forever**.
H. Server is **10.17.1.1:/mnt/tmpfs1** (use your own file server settings here).
I. Set Read/Write to **Read**.
J. Set Prefix to **nfs-writer001**.
K. Turn on the **Use O_DIRECT** checkbox.

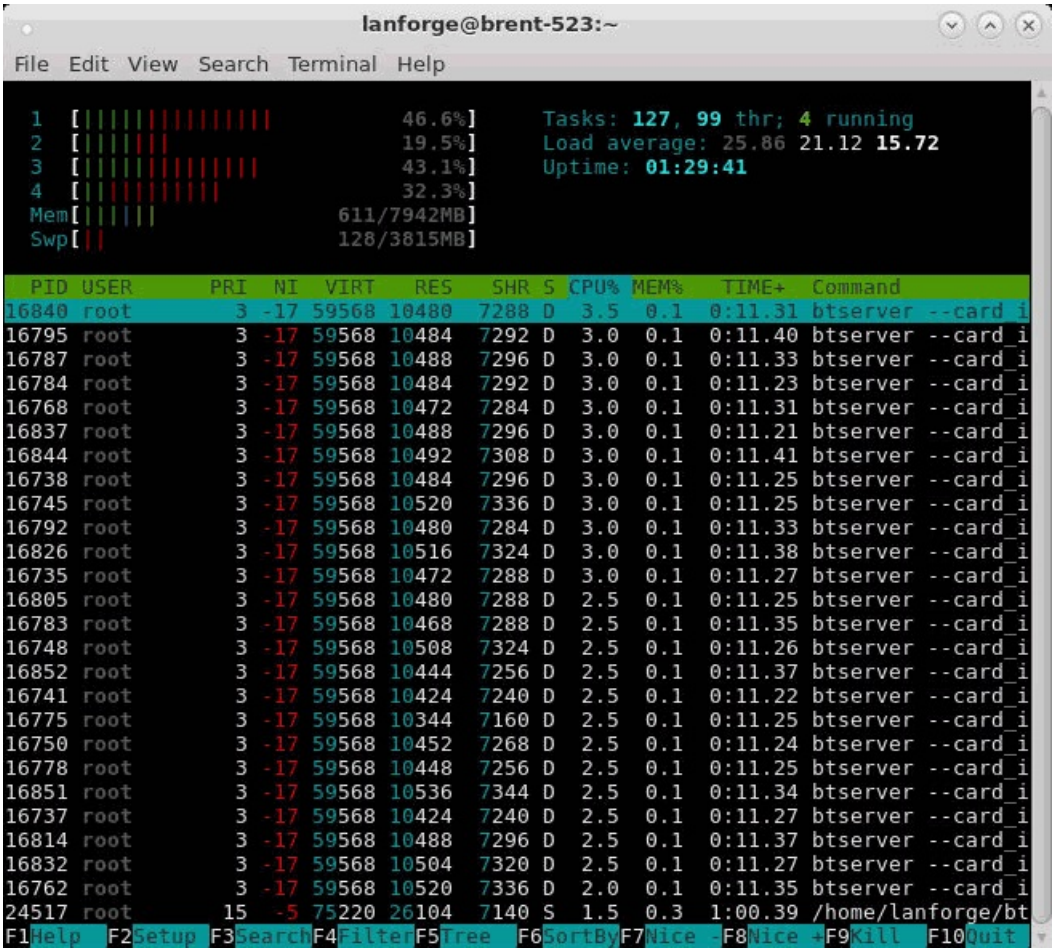
3. Start the first **50 writers** then the first **50 readers**. It's recommended to slowly start File-IO endpoints, for example, starting 25 writers then 25 readers then the same again until you have the desired amount running. The reason to do this is because the system may become unresponsive if it can't handle the number of File-IO endpoints.
   Note: If you notice the system slowing down, connections not starting, or connections stuck in WAITING state, or any weirdness in general, you should stop 25 or 50 writers/readers at a time until the system clears up.



4. Now that 50 File-IO endpoints are running, the memory will be analyzed via htop.
    A. Open a terminal on the LANforge system using a preferred method (either directly or remotely through ssh, rdesktop, or vncviewer).



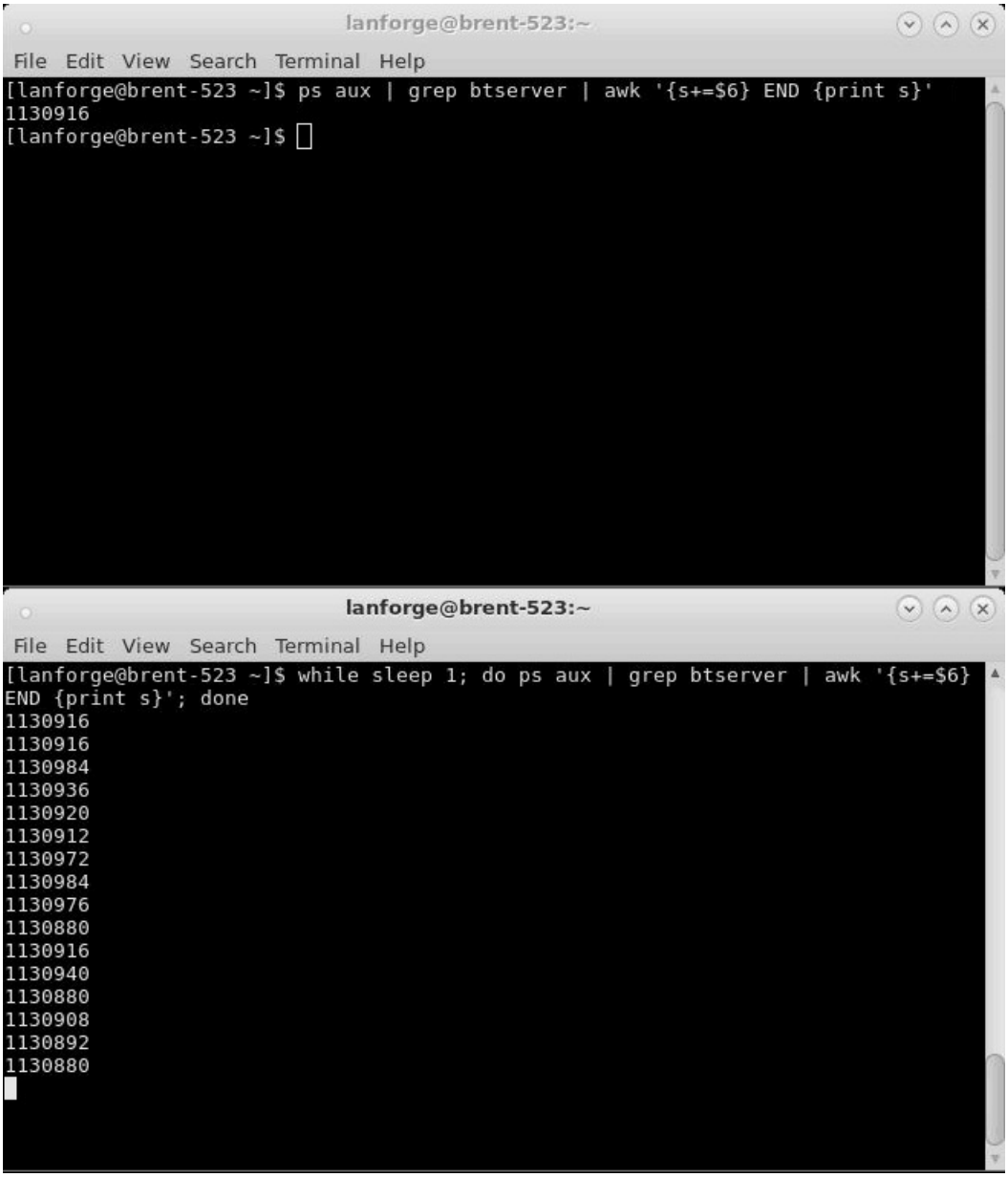
B. Show a list of btserver processes (LANforge processes) by running the command:
`htop -p `pgrep btserver | tr "\n" "," | sed 's/,$//'``
If htop isn't installed run: `sudo yum install htop`



A. The majority of btserver processes with the same or similar values here represent the running File-IO endpoints. The **RES** (resident value) column represents the memory used by these File-IO endpoints. The current test uses an average of about 10,400 KiB or **10.6 MB** per btserver process. These values should be monitored as the File-IO settings are adjusted.

   NOTE: You will need to restart htop if the endpoints are stopped/restarted. Just press **q** to quit out and run the above htop command again.

C. Total up the RES memory used by btserver. This is useful to compare memory usage between a different number of connections. For example you could compare how much memory 100 endpoints use compared to 500 endpoints.

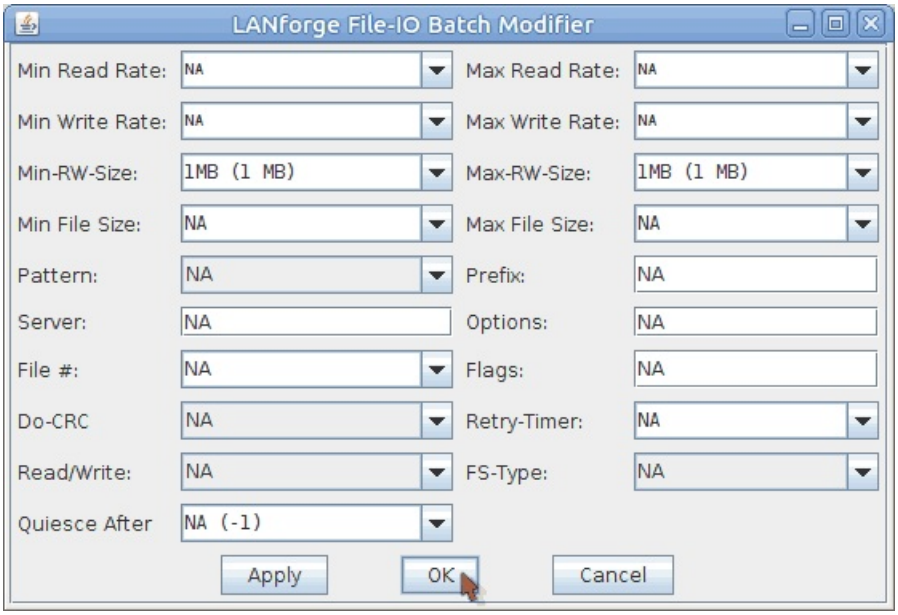


A. To show the total RES memory used, run the command:
`ps aux | grep btserver | awk '{s+=$6} END {print s}'`
To repeat it every second, use the below command. Press **Ctrl+C** to stop.
`while sleep 1; do ps aux | grep btserver | awk '{s+=$6} END {print s}'; done`

B. The total memory for 50 NFS File-IO endpoints with a **Min/Max RW rate of 4k** is about 1,130,000 KiB which converts to around **1,157 MB**.

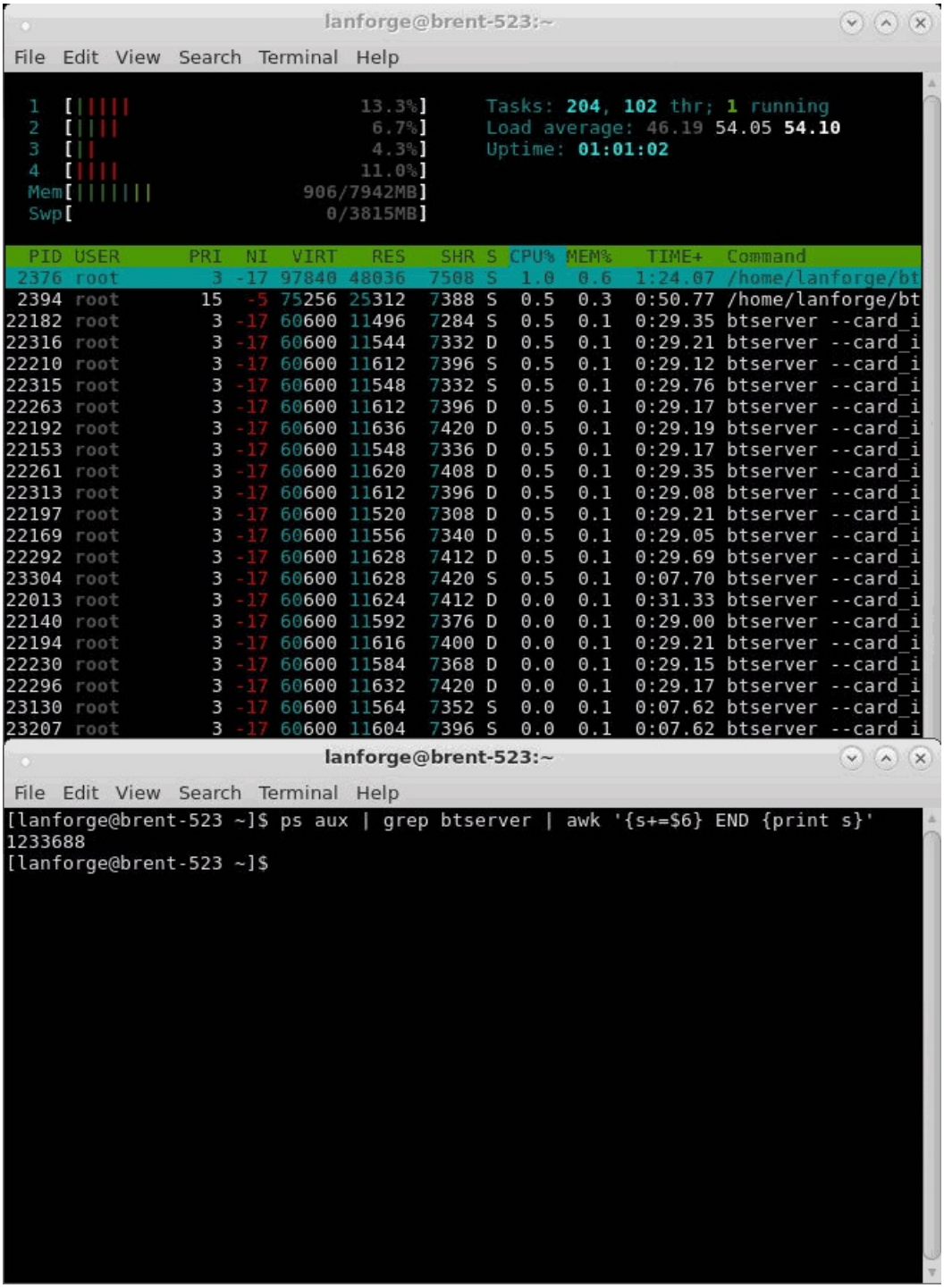
5. While the File-IO endpoints are running, change the **Min-RW** and **Max-RW** settings.

A. Select all File-IO endpoints and click **Batch Modify**.



A. Set the **Min/Max RW sizes** to **1MB**.
B. Click **OK**

6. Analyze how the Min/Max RW size setting change has affected the memory (see steps 4B and 4C).

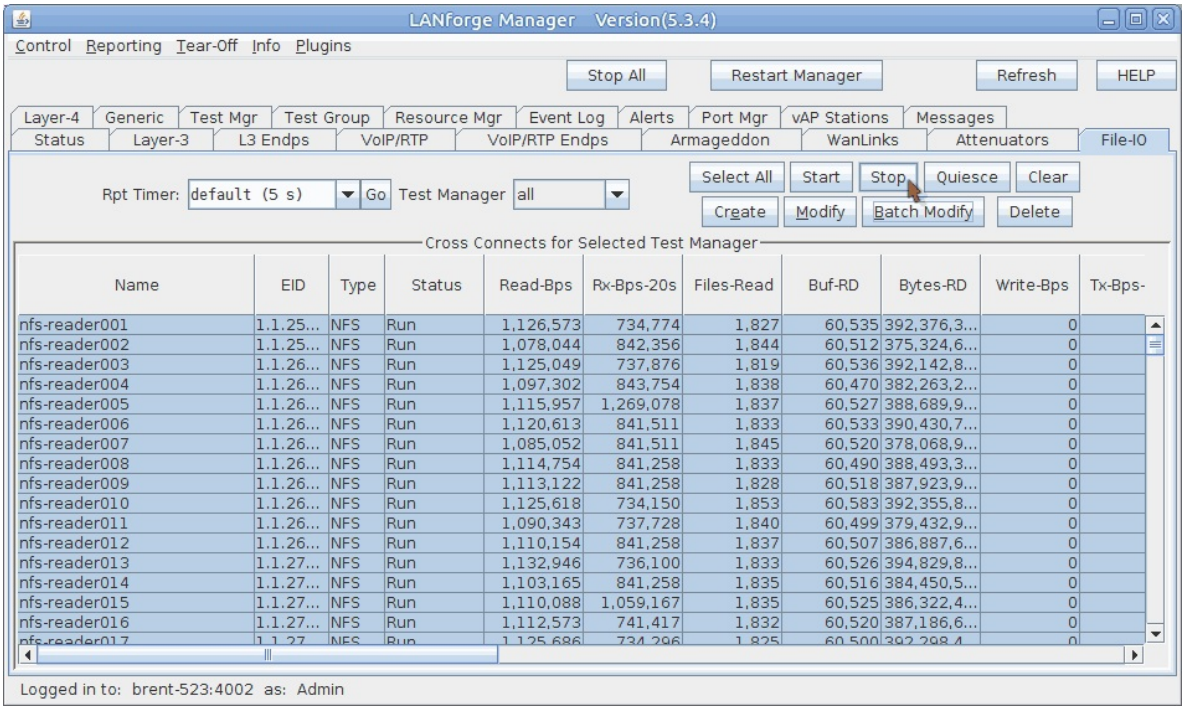


A. Changing the Min/Max RW sizes to 1MB increased the btserver memory use to about 11,600 KiB or **11.9 MB** from 10,400 KiB or **10.6 MB**. About a 1,200 KiB or **1.3 MB** difference.

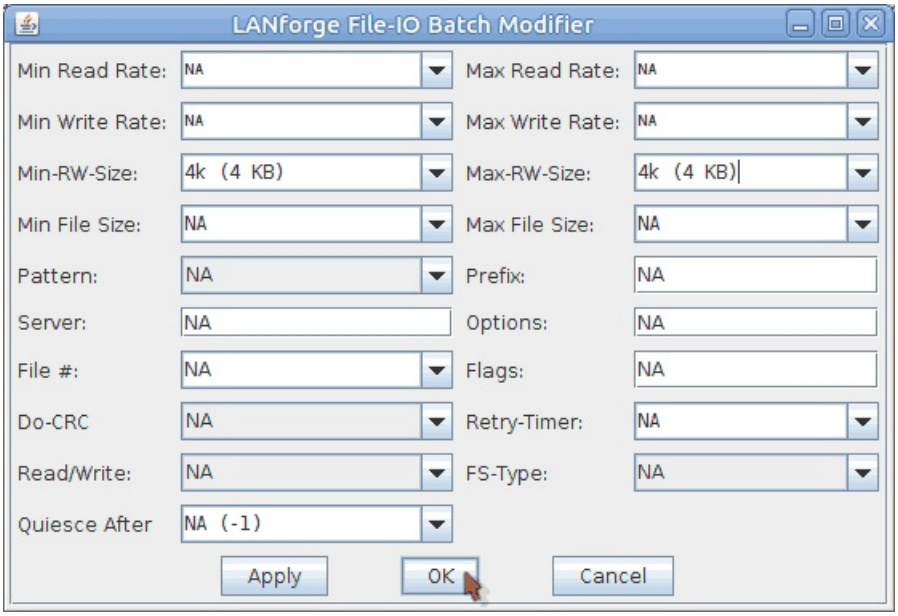
   The total memory increased to 1,233,000 KiB, **1,262 MB** from 1,130,000 KiB, **1,157 MB**. About a 103,000 KiB or **105 MB** difference.

7. Set the endpoints **Min/Max RW** size back to **4k**.

A. Stop all running file-IO endpoints by selecting them and clicking **Stop**.



B. Select all file-IO endpoints and click **Batch Modify**.



A. Set the **Min/Max RW sizes** to **4k**.

B. Click **OK**.

8. Repeat steps **3 through 7** for **125 writers/readers** and then again for **250 writers/readers**.

9. The results from the above tests are shown in the below tables. They show how RW size affects 100, 250, and 500 NFS File-IO endpoints.

Individual Process Memory Usage (MB)				
		Number of File-IO Endpoints		
		100	250	500
RW Size	4 KB	10.6	10.8	10.8
	1 MB	11.9	11.9	11.8

Total Memory Usage (MB)				
		Number of File-IO Endpoints		
		100	250	500
RW Size	4 KB	1,157	2,804	4,134
	1 MB	1,262	3,031	6,013